Operational Summary for Vegetation Management

Dry Alder Complex

Dry Alder Complex

This operational summary provides information about vegetation management in the dry alder complex. This complex is dominated by Sitka alder (*Alnus viridus* spp. *sinuata*) with Willow (*Salix* spp.) causing shrub competition in some areas. Dominant herb species in the complex are pinegrass (*Calamagrostis rubescens*) on sites drier than mesic, and fireweed (*Epilobium angustifolium*) on sites wetter than mesic.

Topics covered in this summary include complex development and interaction with crop trees; treatments that affect development of the complex; non-timber values and pre-harvest considerations; and management strategies for current and backlog sites.

Other Titles in this Series

Operational Summary for Vegetation Management:

- Ericaceous Shrub Complex
- Fireweed Complex
- Mixed-shrub Complex
- Pinegrass Complex
- Wet Alder Complex
- Willow Complex

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Foreword

Managing competing vegetation during reforestation can be challenging. Combinations of plants that thrive in seral ecosystems are often well suited to dominating sites following harvesting or wildfire. While many treatment methods for limiting the growth and spread of these vegetation complexes have been explored, efficacy has varied widely. This is due in part to the widely varying mix of parameters from site to site, including the number, health and structure of the competing plants on site, site conditions and timing of forestry activities. In addition, while some treatments may provide suitable control, the cost in terms of site degradation, hazard to surrounding habitat or crop trees, or the cost of the treatment itself may be prohibitive.

Much work has been undertaken during the past decade by ecologists, silviculturists, and vegetation management specialists on identifying the characteristics of and the range of treatment options for major competing vegetation complexes. Until recently, however, knowledge about managing particularly challenging vegetation complexes was scattered. This series summarizes the key information needed to identify and manage important vegetation complexes in British Columbia.

Introduction

This operational summary provides information about vegetation management issues in the dry alder complex. Topics include: complex development and interaction with crop trees; treatments that affect development of the complex; non-timber and pre-harvest considerations; and management strategies for current and backlog sites. Each complex includes several plant species and may be found over a wide range of ecosystems. As a result, response to treatments will vary within complexes, and prescriptions should be developed on a site-specific basis.

1. Description

Species Composition

Sitka alder (*Alnus viridis* spp. *sinuata*) is the predominant shrub species in the dry alder complex. Willow (*Salix* spp.) can cause shrub competition in portions of the area.

Dominant herb species are pinegrass (*Calamagrostis rubescens*) and/or fireweed (*Epilobium angustifolium*). Pinegrass predominates on sites drier than mesic, and fireweed dominates on sites wetter than mesic.

Occurrence

The dry alder complex is most common on dry to fresh sites in all subzones of the MS zone. It is also commonly found in the IDF zone and drier subzones and variants of the SBS and ICH.

The complex occurs on a variety of soils and parent materials, but is most common on moderately well- to well-drained, coarse- to loamy-textured Brunisols and Luvisols.

2. Development

Reproduction

Sitka alder and willow colonize disturbed sites primarily by wind-borne seed. Sitka alder seeds disperse during the late fall and winter and germinate the following spring. Most willow seeds germinate within two weeks after dispersal in the spring. Both species germinate best on moist exposed mineral soil and in full sunlight.

Sitka alder, a nitrogen-fixing pioneer species, colonizes severely disturbed sites such as roadcuts, skidtrails, and clearcuts. Once established, alder spreads slowly by vegetative reproduction. Both Sitka alder and willow sprout from damaged or cut stumps. Willow also establishes from buried stem and root fragments.

Pinegrass seed is produced infrequently, usually in open areas and during moist weather. The wind-dispersed seed germinates most readily on moist, recently disturbed or burned ground. Plants also spread vegetatively by creeping rhizomes.

Fireweed can aggressively invade new sites. The light wind-borne seed is dispersed in late summer and fall and germinates within one year on exposed, moist mineral soil. Once established, fireweed can also spread by developing new shoots from its fleshy root system.

Rate of Development

Sitka alder, pinegrass, and scattered fireweed are usually present in the understory of lodgepole pine forests. Under the canopy, Sitka alder can reach 50% cover and 4 m in height. Pinegrass cover depends on canopy closure.

Established Sitka alder spreads slowly following harvest. In the MS zone, the dry alder complex is fully developed from 3 to 20 years after harvest. At full maturity, alder cover and height average 30–50% and 3–4 m, respectively.

Sprout growth of Sitka alder ranges from 20 to 120 cm/year depending on site quality. Cut alder stems produce about 3–20 new stems per cut stem. Consequently, the density of alder stems can increase dramatically after each manual cutting.

Willow can outgrow Sitka alder. Growth of willow resprouts ranges from 60 to 200 cm/year. However, the competitive effects of willow are localized because it occurs infrequently in the dry alder complex.

On sites dominated by pinegrass, a dense cover can develop within one year of light disturbance or within four years of severe disturbance. On fireweed sites, a dense fireweed cover can develop within 1–3 years of disturbance.

Treatments that Affect Development

Several factors or activities favour the development of this complex, including:

- treatments or activities that expose mineral soil, (e.g., severe broadcast burns or mechanical site preparation)
- complete overstory removal leading to seed-in of alder or willow where mineral soils are exposed
- nitrogen fertilization.

Some factors or activities that can hinder the development of this complex include:

- severe fire or mechanical disturbance, which destroys roots and rhizomes
- domestic grasses seeded on prepared sites
- not removing the overstory cover.

Interactions with Crop Trees

In coastal British Columbia, Sitka alder is a relatively minor competitor. However, it can become a major competitor following harvesting on moist sites in the Interior. A dense canopy of alder can suppress shade-intolerant seedlings such as Douglas-fir. Scattered alder plants, although not threatening during early plantation establishment on cutblocks, may grow to form dense thickets and affect conifer survival and growth. Sitka alder may also damage crop trees through snowpress in areas with moderate to high snowfall.

In many cases, competition from the dry alder complex does not significantly affect the performance of crop trees unless the alder is growing in close proximity to the crop trees. In fact, retaining some alder may be beneficial as it can 'fix' nitrogen. The competition threshold, or amount of alder that can be retained without significant crop losses, varies with site conditions. In general, Sitka alder appears to be more competitive on more productive sites. Competitive interactions and the control required must be assessed on each site.

3. Non-timber Values

All of the plant species in the dry alder complex are valuable food sources for small mammals and provide important habitat diversity in the relatively uniform lodgepole pine dominated forests where this complex occurs. Sitka alder has relatively low browse value for ungulates but most of the common upland willows are important browse species, especially for moose. Pinegrass can be a vital source of spring forage for cattle and ungulates.

4. Pre-harvest Considerations

Silvicultural System

If alder is present prior to harvesting, it may quickly dominate the site following removal of the forest canopy. Spread of the alder can be minimized if planting is carried out promptly following harvest.

Advance Regeneration

Advance regeneration is rarely a factor to be considered in managing on these sites as lodgepole pine and Douglas-fir are shade-intolerant. However, protecting advance conifer regeneration under a dense canopy of alder may reduce regeneration problems.

Method of Reforestation

Sites with adequate cones are sometimes drag scarified to promote natural regeneration. When alder is a serious problem, planting is required. Natural regeneration is suitable on sites with low density of alder in the understory. On sites with insufficient natural regeneration, disc trenchers and other lightweight mechanical site preparation (MSP) equipment can be used to prepare planting spots. However, low-impact MSP will aggravate alder invasion. The alder, damaged by the MSP treatment, will sprout from root crowns and stem bases. Follow-up treatments will be required.

Timing

As pinegrass and fireweed cover develop rapidly, immediate site preparation and planting (if necessary) are recommended to take advantage of the competition-free environment and warmer soil temperatures.

5. Vegetation Management Strategies for Current Sites

Site Preparation

Mechanical

Mechanical treatments are often very effective site preparation methods in the dry alder complex. Mechanical treatments enhance natural regeneration of pine by exposing mineral soil and disturbing cone-bearing slash. Increased contact with mineral soil promotes cone opening and seed germination. Mechanical site preparation (e.g., disc trenching and drag scarification), which mechanically damage the alder, also improves plantation success. With prompt planting, brushing is usually not needed to get lodgepole pine above the alder.

Drag scarification is often used to improve natural regeneration of lodgepole pine. Where lodgepole pine cones are abundant, moderate pinegrass cover should be retained to prevent pine overstocking. Follow-up brushing treatments may be necessary where damage incurred during harvest or scarification stimulates vigorous sprouting of shrubs and rhizomatous herbs.

Medium- to high-impact drag scarification treatments are often required where pinegrass competition is intense and the cone crop is poor. These treatments remove surface debris and the organic layer, and expose the A horizon in patches and furrows. To establish a Douglas-fir plantation, the ripper plow or Leno patch scarifier are recommended. Any MSP treatment that produces a continuous furrow (e.g., disc trencher, ripper, ripper plow) is recommended when establishing a lodgepole pine plantation. For further details on MSP in pinegrass, see *Operational Summary for Vegetation Management: Pinegrass Complex*.

Mineral soil exposure caused by medium- to high-impact MSP will create a seedbed suitable for Sitka alder, willow, fireweed, and pinegrass germination. Consequently, MSP should be done in early- to mid-summer when the current year's alder cones are immature. The site should be planted immediately following MSP treatment, unless a reliable source of lodgepole pine seed exists on site.

Screefing

The low- to medium-impact disturbance provided by screefing favours pinegrass and fireweed invasion. Any control will be short lived.

Prescribed Fire

Prescribed fire may provide an additional two years of alder control over MSP. However, low- to medium-intensity burns will not control sprouting from root crowns since they do not kill root systems. High-intensity burns, which kill root systems, may cause site disturbance and rapid seeding-in of fireweed, alder, and willow. High intensity burns are not recommended since these sites usually have thin forest floors.

Chemical

Chemical site preparation is used where vegetative competition develops rapidly, especially on areas too sensitive for MSP or prescribed fire. Foliar applications of high rates of glyphosate provide good control of Sitka alder, willow, fireweed, and pinegrass. Triclopyr ester can provide effective control of Sitka alder and willow.

Seeding

Seeding grasses and/or legumes appears to reduce the amount of fireweed on the site.

Livestock Grazing

Repeated sheep browsing treatments can effectively control fireweed competition. While sheep can also effectively browse pinegrass, this treatment should be carried out early in the season when pinegrass is most palatable.

Planting

General

Natural regeneration of lodgepole pine should be encouraged where a suitable cone crop occurs. However, understocking may occur in areas of rapid pinegrass development. To avoid not satisfactorily restocked (NSR) patches in such areas, trees may be planted after harvesting.

Timing
Where planting is necessary, plant immediately after disturbance. Further delays will reduce plantation success by allowing competing vegetation to occupy the site.

Stock Type
Small stock types (e.g., PSB 211 for Pl and 313B for Fdi) may be adequate on sites drier than mesic. However, larger stock types (e.g., PCT 313B for Pl) are preferred on mesic or wetter sites where competition from Sitka alder, willow, and fireweed is more intense.

Species Selection
Douglas-fir and lodgepole pine are the preferred species for planting. Lodgepole pine is preferred on drier sites, and, due to its rapid juvenile growth rate, on sites where competition is intense.

Brushing

General
Brushing treatments are often required, particularly on the mesic and wetter communities.

Manual
Although Sitka alder and willow sprout prolifically following manual cutting, this treatment is ideal on dry sites. A single manual cutting can be effective on sites that are submesic and drier, where sprout growth rates are typically slow (<50 cm/yr), and where crop trees are at least 1 m tall. Otherwise, two manual brushing treatments may be necessary to provide seedlings with a free-growing environment.

Spacing of conifers can be done concurrently with manual brushing when the plantation is 12 to 15 years old. At that time, lodgepole pine should be roughly the same height as neighbouring alder (2–4 m). Manual brushing has been successful in releasing 5- to 7-year-old conifers that were growing poorly due to high alder densities. However, repeat treatments are often necessary in such cases.

While season of cutting may affect alder growth during the first growing season after treatment, these effects may not be evident in subsequent years. Summer drought may reduce the ability of Sitka alder to resprout.

Girdling is not considered an effective treatment because of the multi-stemmed growth form of Sitka alder.

Chemical
Glyphosate provides good control of Sitka alder, willow, pinegrass, and fireweed. It has been successfully applied as a broadcast spray to mature clumps, a swab or squirt to cut stumps, and a broadcast spray to sprouts 1–3 years following manual cutting. Drought stress, however, may increase the resistance of Sitka alder to glyphosate. Partial spray coverage of an alder clump will produce incomplete control because glyphosate is only translocated to the stems and roots on the side to which it is applied.

Hexazinone has effectively controlled willow and pinegrass. However, it has provided variable control of Sitka alder and fireweed. Conifer seedlings, particularly lodgepole pine, may be damaged by hexazinone.

Foliar application of 2,4-D ester controls Sitka alder only. Applying 2,4-D amine to freshly cut stumps adequately controls alder and willow, although some basal resprouting occurs.

Triclopyr ester can also provide effective control of Sitka alder and willow. It may be applied as a foliar, cut-stump or basal bark treatment.

Hack-and-squirt treatments are inappropriate due to the multi-stemmed growth form and stringy bark of Sitka alder.

Livestock Grazing

Repeated sheep browsing treatments have successfully controlled fireweed and pinegrass. Other plant species in this complex, such as Sitka alder, are not effectively browsed. Although willow may be palatable, sheep cannot effectively graze on shrubs taller than 1 m. Cattle grazing may be successful in this complex if the grazing project is well managed.

Browse damage to conifers varies by season as well as the type, abundance and height of crop trees, and target vegetation on the site. For example, lodgepole pine is most sensitive to mechanical damage when pinegrass is most palatable. Lodgepole pine is more palatable than either Douglas-fir or spruce. Also, conifers are most palatable when they are flushing.

6. Vegetation Management Strategies for Backlog Sites

General

Treatment of backlog sites depends on whether the existing regeneration is worth preserving. If stocking is poor, then MSP or prescribed fire may be appropriate. If the existing regeneration is worth saving, then herbicides or mechanical spot treatments and fill-in planting may be appropriate.

When a backlog site is prepared for regeneration, it resembles a recently harvested area. However, the remaining alder and willow root systems are extensive and sprouts can quickly re-occupy the site. Consequently, follow-up brushing treatments will often be necessary.

Mechanical

When stocking is low and not worth preserving, medium- to high-impact MSP can successfully control the complex, but may cause site degradation. As MSP treatment exposes mineral soil, it should occur in early to late summer before alder seed dispersal.

Prescribed Fire

Medium- to high-intensity burns have successfully controlled established Sitka alder for 5–7 years in the SBS and ESSF zones. Alder recovery is relatively slow.

Chemical

Glyphosate is the only registered herbicide with a broad enough efficacy spectrum to control all species in the dry alder complex. It has successfully controlled the complex when applied as a broadcast spray in late summer. Glyphosate and triclopyr ester are effective on alder and willow if applied to stumps or new sprouts following manual cutting.

"Brown-and-Burn"

"Brown-and-burn" treatments have not been widely applied to rehabilitate this complex. Where applicable, however, glyphosate can be used to brown the foliage and thereby facilitate burning. Glyphosate should be applied in June–July to allow the vegetation 6–10 weeks to cure. Burning should be carried out the same fall or the following spring. Extra precautions are needed for "brown-and-burn" treatments since they are generally conducted in periods when fire escape hazard is high.

7. Summary of Treatment Efficacy

Choosing appropriate treatments will depend on community composition, site quality, and cone crop. On dry sites, natural regeneration, minimal planting, and manual brushing/juvenile spacing at 10–15 years are choices for managing vegetative competition.

Where natural regeneration is inadequate or pinegrass competition is severe, using a disc trencher or ripper, planting with fast-growing species and large stock, and follow-up manual or chemical brushing within 3–5 years are effective. However, medium- to high-impact MSP treatments may cause soil disturbance and promote alder and willow invasion.

Grazing/browsing may be appropriate on sites with relatively low levels of Sitka alder.

Among chemical treatments, glyphosate is recommended because of its broad efficacy spectrum. It provides four or more years of alder control if spray coverage is good. Glyphosate is suitable for site preparation, brushing, and backlog sites. Moderate rates (1.1 kg a.i./ha) can often control vegetation under 1.5 m tall; higher rates (2.1 kg a.i./ha) are needed in taller canopies. Glyphosate leaves the conifers undamaged when applied in the fall.

Hexazinone applied by spot gun provides excellent control of willow and pinegrass but variable control of alder and fireweed. Hexazinone can also damage crop trees, lodgepole pine is particularly sensitive. As a site preparation treatment, hexazinone may control spread of pinegrass, but is not recommended for control of Sitka alder. Applying 2,4-D amine, glyphosate, or triclopyr to freshly cut stumps provides good control of alder. Basal bark application of triclopyr provides effective control of willow and alder.

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Appendix – Key to Biogeoclimatic Zones of British Columbia

AT	Alpine Tundra	IDF	Interior Douglas-fir
BG	Bunchgrass	MH	Mountain Hemlock
BWBS	Boreal White and Black Spruce	MS	Montane Spruce
CDF	Coastal Douglas-fir	PP	Ponderosa Pine
CWH	Coastal Western Hemlock	SBPS	Sub-Boreal Pine–Spruce
ESSF	Engelmann Spruce–Subalpine Fir	SBS	Sub-Boreal Spruce
ICH	Interior Cedar–Hemlock	SWB	Spruce–Willow–Birch